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TRANSMITTAL LETTER TO THE UNITED STATES  
DESIGNATED/ELECTED OFFICE (DO/EO/US)  
CONCERNING A FILING UNDER 35 U.S.C. 371

0104-0389P

U.S. APPLICATION NO. (If known, see 37 CFR 1.5)

10/009848

INTERNATIONAL APPLICATION NO.

INTERNATIONAL FILING DATE

PRIORITY DATE CLAIMED

PCT/SE00/01945

October 6, 2000

October 6, 1999

TITLE OF INVENTION

FEMUR FIXTURE AND SET OF FEMUR FIXTURES

APPLICANT(S) FOR DO/EO/US

ALBREKTSSON, Tomas; JACOBSSON, Magnus; MACDONALD, Warren; CARLSSON, Lars; WENNBORG, Stig

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39 (1).
4. ☒ The US has been elected by the expiration of 19 months from the priority date (Article 31).
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
  - a. ☒ is transmitted herewith (required only if not transmitted by the International Bureau). WO 01/24738
  - b. ☒ has been transmitted by the International Bureau.
  - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☐ An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
  - a. ☐ is transmitted herewith.
  - b. ☐ has been previously submitted under 35 U.S.C. 154(d)(4)
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)).
  - a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
  - b. ☐ have been transmitted by the International Bureau.
  - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
  - d. ☒ have not been made and will not be made.
8. ☐ An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☐ An English language translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 20. below concern document(s) or information included:

11. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98, Form PTO-1449(s), and International Search Report (PCT/ISA/210) with 0 cited document(s).
12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☒ A **FIRST** preliminary amendment.
14. ☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
15. ☐ A substitute specification.
16. ☐ A change of power of attorney and/or address letter.
17. ☐ A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821-1.825.
18. ☐ A second copy of the published international application under 35 U.S.C. 154(d)(4).
19. ☐ A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).
20. ☒ Other items or information:
  - 1.) PCT/IB/308
  - 2.) PCT/IPEA/409
  - 3.) FOur (4) sheets of Formal Drawings

Form PTO-1390 (REV 11-2000) page 2 of 2



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PATENT  
0104-0389P

IN THE U.S. PATENT AND TRADEMARK OFFICE

Applicant: ALBREKTSSON, Tomas et al.  
Int'l. Appl. No.: PCT/SE00/01945  
Appl. No.: 10/089,848 Group:  
Filed: April 4, 2002 Examiner:  
For: FEMUR FIXTURE AND SET OF FEMUR  
FIXTURES

**PRELIMINARY AMENDMENT**

**BOX PATENT APPLICATION**

Assistant Commissioner for Patents  
Washington, DC 20231

May 31, 2002

Sir:

The following Preliminary Amendments and Remarks are respectfully submitted  
in connection with the above-identified application.

**IN THE CLAIMS:**

Please amend the claims as follows:

49. (AMENDED) The femur fixture as claimed in claim 42, wherein said  
connecting section is at least partly provided with a smooth surface.

51. (AMENDED) The femur fixture as claimed in claim 42, wherein one or more  
self-tapping cutting recesses are provided at least in part on said connecting section.

62. (AMENDED) The femur fixture as claimed in claim 59, wherein the height of the screw thread profile on the frusto-conical proximal section is no greater than 0.3 mm.

63. (AMENDED) The femur fixture as claimed in claim 59, wherein the screw thread profile on the frusto-conical proximal section is formed by the turns of one or more screw threads.

64. (AMENDED) The femur fixture as claimed in claim 58, wherein said circumferentially oriented roughness is in the form of circumferential beads.

## REMAKRS

Claims 38-74 are now present in the application. Claims 49, 51, 62-64 have been amended. Claim 38 is independent.

Favorable action on the above-identified application is respectfully requested.

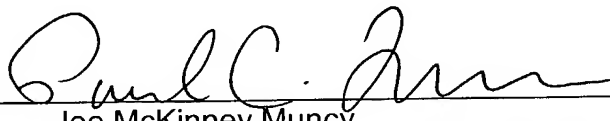
In the event there are any matters remaining in this application, the Examiner is invited to contact Paul C. Lewis, Registration No. 43,368 at (703) 205-8000 in the Washington, D.C. area.

Attached hereto is a marked-up version of the changes made to the application by this Amendment.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

BIRCH, STEWART, KOLASCH & BIRCH, LLP

By   
Joe McKinney Muncy  
For Reg. No. 32,334 #43,368

KM/PCL/cl

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Attachment: Version with Markings to Show Changes Made

**VERSION WITH MARKINGS TO SHOW CHANGES MADE**

**IN THE CLAIMS:**

**The claims have been amended as follows:**

49. (AMENDED) The femur fixture as claimed in claim [46] 42 , wherein said connecting section is at least partly provided with a smooth surface.

51. (AMENDED) The femur fixture as claimed in claim [52] 42, wherein one or more self-tapping cutting recesses are provided at least in part on said connecting section.

62. (AMENDED) The femur fixture as claimed in claim [60] 59, wherein the height of the screw thread profile on the frusto-conical proximal section is no greater than 0.3 mm.

63. (AMENDED) The femur fixture as claimed in claim [60] 59, wherein the screw thread profile on the frusto-conical proximal section is formed by the turns of one or more screw threads.

64. (AMENDED) The femur fixture as claimed in claim [59] 58, wherein said circumferentially oriented roughness is in the form of circumferential beads.

PATENT  
0104-0389P

IN THE U.S. PATENT AND TRADEMARK OFFICE

Applicant: ALBREKTSSON, Thomas et al.  
Int'l. Appl. No.: PCT/SE00/01945  
Appl. No.: New Group:  
Filed: April 4, 2002 Examiner:  
For: FEMUR FIXTURE AND SET OF FEMUR  
FIXTURES

PRELIMINARY AMENDMENT

**BOX PATENT APPLICATION**

Assistant Commissioner for Patents  
Washington, DC 20231

April 4, 2002

Sir:

The following Preliminary Amendments and Remarks are respectfully submitted in connection with the above-identified application.

AMENDMENTS

IN THE SPECIFICATION:

Please amend the specification as follows:

Before line 1, insert --This application is the national phase under 35 U.S.C. § 371 of PCT International Application No. PCT/SE00/01945 which has an International filing date of October 6, 2000, which designated the United States of America.--

**IN THE CLAIMS:**

Please cancel claims 1 through 37 without prejudice or disclaimer to the subject matter contained therein.

Please add the following new claims:

--38. (New) A femur fixture for a hip-joint prosthesis, comprising an intraosseous anchoring structure of a generally circular cross-section for screwing laterally into a complementary bore drilled laterally into the neck of a femur after resection of the femur head to an anchored position, the intraosseous anchoring structure having a proximal end, a distal end, a relatively short frusto-conical proximal section at the proximal end, and a proximal cylindrical section having a screw thread profile thereon and extending towards the distal end from the frusto-conical proximal section, the frusto-conical proximal section and the proximal cylindrical section each being dimensioned so as to bear against the cortex of the femur neck when the intraosseous anchoring structure is in the anchored position.

39. (New) The femur fixture as claimed in claim 38, wherein the intraosseous anchoring structure is so dimensioned that its distal end projects through the lateral cortex of the femur when the intraosseous anchoring structure is in the anchored position.



Docket No. 0104-0389P

40. (New) The femur fixture as claimed in claim 38, wherein the intraosseous anchoring structure further has a distal cylindrical section having a screw thread profile thereon and extending towards the proximal cylindrical section from the distal end of the intraosseous anchoring structure, the diameter of said distal cylindrical section being less than the diameter of said proximal cylindrical section.

41. (New) The femur fixture as claimed in claim 40, wherein the screw thread profiles of said proximal and distal cylindrical sections are essentially the same.

42. (New) The femur fixture as claimed in claim 40, wherein said intraosseous anchoring structure further comprises a tapered connecting section provided between and interconnecting said proximal and distal cylindrical sections.

43. (New) The femur fixture as claimed in claim 42, wherein said connecting section has a frusto-conical shape which at one end has a base diameter essentially equal to the diameter of said proximal cylindrical section, and at the other end has a top diameter essentially equal to the diameter of said distal cylindrical section.

Docket No. 0104-0389P

44. (New) The femur fixture as claimed in claim 42, wherein said connecting section has a flank angle in the range of 15°-45°.

45. (New) The femur fixture as claimed in claim 42, wherein said connecting section is at least partly provided with a blasted surface.

46. (New) The femur fixture as claimed in claim 42, wherein said connecting section is at least partly provided with a circumferentially oriented roughness.

47. (New) The femur fixture as claimed in claim 46, wherein said circumferentially oriented roughness has a height less than that of the screw thread profiles of said proximal and distal cylindrical sections.

48. (New) The femur fixture as claimed in claim 46, wherein the height of said circumferentially oriented roughness is no greater than 0.3 mm.

49. (New) The femur fixture as claimed in claim 46, wherein said connecting section is at least partly provided with a smooth surface.

Docket No. 0104-0389P

50. (New) The femur fixture as claimed in claim 42, wherein the entire surface of said connecting section is smooth.

51. (New) The femur fixture as claimed in claim 52, wherein one or more self-tapping cutting recesses are provided at least in part on said connecting section.

52. (New) The femur fixture as claimed in claim 38, wherein said frusto-conical proximal section at an end thereof interfacing said proximal cylindrical section presents a diameter essentially equal to the diameter of said proximal cylindrical section.

53. (New) The femur fixture as claimed in claim 38, wherein said frusto-conical proximal section has a flank angle in the range of 8-15°.

54. (New) The femur fixture as claimed in claim 38, wherein the frusto-conical proximal section has an axial extent in the range of 5-10 mm.

55. (New) The femur fixture as claimed in claim 38, wherein the frusto-conical proximal section has a proximal diameter in the range of 18-30 mm.

57. (New) The femur fixture as claimed in claim 56, wherein said roughened surface is at least partly a blasted surface.

59. (New) The femur fixture as claimed in claim 58, wherein said circumferentially oriented roughness is in the shape of a screw thread profile.

61. (New) The femur fixture as claimed in claim 60, wherein the screw thread profile of said frusto-conical proximal section has a height less than the screw thread profile of said proximal cylindrical section.

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62. (New) The femur fixture as claimed in claim 60, wherein the height of the screw thread profile on the frusto-conical proximal section is no greater than 0.3 mm.

63. (New) The femur fixture as claimed in claim 60, wherein the screw thread profile on the frusto-conical proximal section is formed by the turns of one or more screw threads.

64. (New) The femur fixture as claimed in claim 59, wherein said circumferentially oriented roughness is in the form of circumferential beads.

65. (New) The femur fixture as claimed in claim 64, wherein said circumferential beads has a height less than that of the screw thread profile of said proximal cylindrical section.

66. (New) The femur fixture as claimed in claim 64, wherein the height of said circumferential beads is no greater than 0.3 mm.

67. (New) The femur fixture as claimed in claim 38, further comprising a head section for supporting a ball component of the hip-joint prosthesis, said head section comprising a collar section having a distal surface abutting said intraosseous anchoring structure.

68. (New) The femur fixture as claimed in claim 67, wherein said distal surface is inclined inwardly towards the body of the collar section.

69. (New) The femur fixture as claimed in claim 68, wherein said distal surface is inclined inwardly at an inclination angle within the range of 10°-20.

70. (New) The femur fixture as claimed in claim 67, wherein said distal surface is concave.

71. (New) The femur fixture as claimed in claim 67, wherein said distal surface is provided with radially spaced circular beads.

72. (New) The femur fixture as claimed in claim 71, wherein said circular beads have a height in the range of 0.1-0.5.

73. (New) A set of femur fixtures according to claim 38, wherein the frusto-conical proximal section and the proximal cylindrical section of each fixture in the set have different dimensions, whereby the fixture in the set having the frusto-conical proximal section and the proximal cylindrical section of correct size for abutting the cortex of the femur neck of a particular patient can be selected for use in that patient.

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74. (New) A set of femur fixtures according to claim 40, wherein the distal cylindrical sections of all fixtures in the set have the same dimension, and the frusto-conical proximal section and the proximal cylindrical section of each fixture in the set have different dimensions, whereby the fixture in the set having the frusto-conical proximal section and the proximal cylindrical section of correct size for abutting the cortex of the femur neck of a particular patient can be selected for use in that patient.--

**REMARKS**

The specification has been amended to provide a cross-reference to the previously filed International Application.

Entry of the above amendments is earnestly solicited. An early and favorable first action on the merits is earnestly solicited.

Attached hereto is a marked-up version of the changes made to the application by this Amendment.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17; particularly, extension of time fees.

Respectfully submitted,

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0104-0389P

Attachment: VERSION WITH MARKINGS TO SHOW CHANGES MADE

(Rev. 02/21/02)



Docket No. 0104-0389P

VERSION WITH MARKINGS TO SHOW CHANGES MADE

The claims have been amended as follows:

Claims 1 through 37 have been cancelled and new claims 38 to 74 have been added.

(Rev. 11/13/01)

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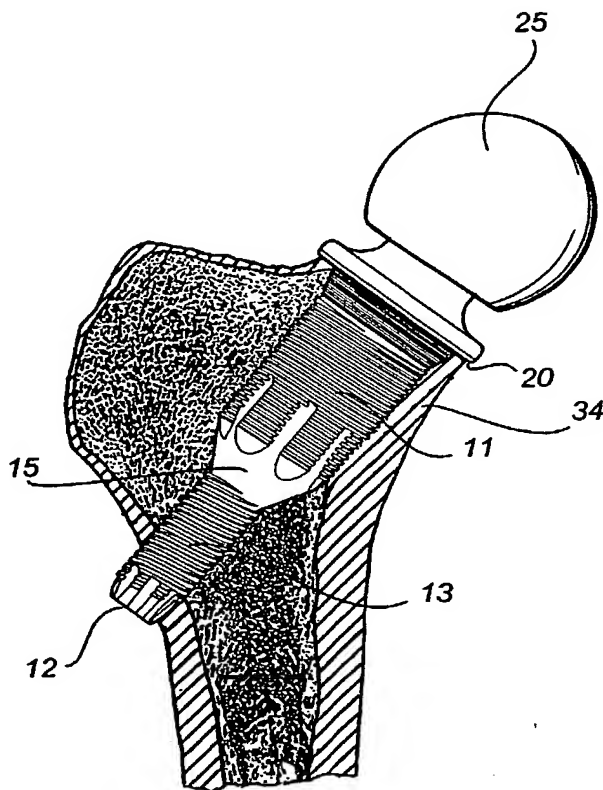
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[Continued on next page]

(54) Title: **FEMUR FIXTURE AND SET OF FEMUR FIXTURES**



(57) Abstract: A femur fixture (1) for a hip-joint prosthesis comprising an intraosseous anchoring structure (3) of a generally circular cross-section for screwing laterally into a complementary bore drilled laterally into the neck of a femur after resection of the femur head to an anchored position. The intraosseous anchoring structure (3) has a proximal end, a distal end, a relatively short frusto-conical proximal section (18) at the proximal end, and a proximal cylindrical section (11) having a screw thread profile thereon. The proximal cylindrical section (11) extends from the frusto-conical proximal section towards the distal end of the anchoring structure (3). The frusto-conical proximal section (18) and the proximal cylindrical section (11) each being dimensioned so as to bear against the cortex of the femur neck when the intraosseous anchoring structure (3) is in the anchored position. The invention also relates to a set of such femur fixtures, wherein the frusto-conical proximal section (18) and the proximal cylindrical section (11) of each fixture (1) in the set have different dimensions, whereby the fixture in the set having the frusto-conical proximal section (18) and the proximal cylindrical section (11) of correct size for abutting the cortex of the femur neck of a particular patient can be selected for use in that patient.

WO 01/24738 A1

4/prb

FEMUR FIXTURE AND SET OF FEMUR FIXTURESField of the Invention

The present invention relates to a femur fixture for a hip-joint prosthesis comprising an intraosseous anchoring structure of a generally circular cross-section adapted for screwing laterally into a complementary bore drilled laterally into the neck of a femur after resection of the femur head to an anchored position. The invention also relates to a set of such femur fixtures.

10 Background of the Invention

A femur fixture of the aforementioned type is disclosed in Applicant's prior International patent application publication WO93/16663. In this femur fixture the intraosseous structure has a screw threaded cylindrical section at the proximal end. The use of a cylindrical proximal section in the intraosseous structure of the femur fixture of WO93/16663 enables the threads thereon to engage with the cortex of the femur neck and increase the fixation strength of the femur fixture in the femur. However, the threads at the terminal proximal section of the cylindrical section do not register in the medial cortex of the femur neck at the resected surface. This is due to the cortex of the femur neck flaring outwardly adjacent the resected surface.

25. This lack of loading of the cortex at the resected surface of the femur by the intraosseous anchoring structure of the femur fixture can lead to bone resorption at the resected surface. This situation is not able to be simply addressed by increasing the diameter of the cylindrical proximal section of the intraosseous anchoring structure of the WO93/16663 femur fixture since it would result in the threads of the cylindrical proximal section puncturing the cortex in the body of the femur neck or



The provision of a relatively short frusto-conical proximal section at the proximal end of the intraosseous anchoring structure thus loads the cortex of the femur neck adjacent the resected surface and the proximal cylindrical section loads the cortex in the body of the fe-

mur neck. Thereby, an improved anchorage of the femur fixture in the femur of the patient can be obtained.

The frusto-conical section preferably has a flank angle in the range of 8-15°, preferably in the range 10-13°, even more preferably approximately 12°.

According to preferred embodiments of the invention the frusto-conical section has an axial extent in the range of 5-10 mm. Preferably, the axial extent is approximately 8 mm.

Advantageously, the proximal end of the frusto-conical proximal section has a diameter in the range of 18-30 mm.

Advantageously, the distal end of the frusto-conical proximal section, i.e. the end interfacing the proximal cylindrical section, has essentially the same diameter as the proximal cylindrical section. Thus, there will be no sharp edges in the transition area between the frusto-conical proximal section and the proximal cylindrical section that could induce undesired stresses.

20 According to preferred embodiments of the invention  
the frusto-conical section has at least partly a rough-  
ened surface. This improves the integration of the  
frusto-conical section with the cortex (termed  
"osseointegration" in the art). The roughening may be  
25 achieved by grit blasting, etching or machining, or by a  
combination of one or more of these roughening tech-  
niques.

Alternatively or additionally, the frusto-conical proximal section could be provided with a circumferentially oriented roughness, preferably machined. Such circumferentially oriented roughness could for instance be provided in the form of grooves, beads, tracks, or screw threads. The provision of such a circumferentially oriented roughness would improve the short term anchorage capacity of the intraosseous anchoring structure due to the engagement of the circumferentially oriented roughness with the cortex of the femur neck adjacent the re-

sected surface, as well as even further promote the os-  
seointegration process.

According to an embodiment of the invention, the frusto-conical proximal section is provided with a screw 5 thread profile similar to that of the proximal cylindrical section.

According to preferred embodiments of the invention, the frusto-conical proximal section has a screw thread profile of a height less than the screw thread profile of the proximal cylindrical section. Preferably, the height of the screw thread profile on the frusto-conical proximal section is no greater than 0.3 mm (microthreads), more preferably in the range 0.1-0.25 mm, and even more preferably approximately 0.2 mm.

15 According to another embodiment of the invention,  
the frusto-conical proximal section is provided with cir-  
cumferential beads of a height less than the screw thread  
profile of the proximal cylindrical section. Preferably,  
the height of the beads is no greater than 0.3 mm, more  
20 preferably in the range 0.1-0.25 mm, and even more pref-  
erably approximately 0.2 mm.

According to preferred embodiments of the invention, the intraosseous anchoring structure is dimensioned such that the distal end of the anchoring structure projects through the lateral cortex of the femur when the intraosseous anchoring structure is in the anchored position. This arrangement, together with the inventive features of having a frusto-conical proximal section at the proximal end of the anchoring structure, provides a strong anchorage of the anchoring structure in the cortical bone tissue of the femur.

Advantageously, the intraosseous anchoring structure further has a screw threaded, distal cylindrical section, which extends from the distal end of the intraosseous an-  
35 choring structure towards the proximal cylindrical section. The diameter of the distal cylindrical section is less than the diameter of said proximal cylindrical sec-



Preferably, the tapered connecting section is at least partly provided with a roughened surface. This

would even further promote the osseointegration process at the transition area between the cylindrical sections. The roughened surface could be achieved through blasting, preferably grit-blasting, etching, or the like. Alternatively or additionally, the surface of the tapered proximal section is provided with a circumferentially oriented roughness, for instance in the form of circumferential beads or screw threads. The height of the beads or screw threads is preferably no greater than 0.3 mm, more preferably in the range of 0.1-0.25 mm, and even more preferably approximately 0.2 mm.

According to an embodiment of the invention as hereinafter described, the tapered connecting section is at least in part provided with one or more self-tapping cutting recesses.

According to preferred embodiments of the present invention, femur fixture further comprises a head section. The head section is provided with a collar abutting the tapered proximal section, which collar delimits the insertion of the femur fixture into bone tissue. Preferably, the surface of the collar facing the proximal section is inclined inwardly so as to mate with a resected bone tissue surface that has been given a correspondingly inclined shape. Preferably, the angle of inclination is within the range of  $10^{\circ}$ - $20^{\circ}$ , preferably approximately  $15^{\circ}$ . Alternatively, the surface of the collar facing the proximal section is given a concave shape, so as to mate with a convex bone tissue surface. Thereby, an improved contact between the femur fixture and the bone surface can be obtained.

Preferably, said collar surface is provided with radially spaced circular beads or grooves for increasing the stability of the inserted femur fixture and promote



Fig. 4 is a longitudinal sectional view of the femur fixture.



15 connecting the proximal cylindrical section 11 to the  
distal cylindrical section 13, and a frusto-conical  
proximal section 18 connecting the proximal cylindrical  
section 11 to the head section 5.

5       The proximal cylindrical section 11 presents a  
screw-threaded outer surface for screwing into an outer  
bone cavity section 32 of said cavity. The distal cylin-  
drical section 13 also presents a screw-threaded outer  
surface, for screwing into a narrow drilled hole 31,  
10 which is coaxial with said outer cavity section 32. The  
screw-threads of the proximal cylindrical section 11 have  
the same pitch and height as those of the distal cylin-  
drical section 13.

      The major diameters of the screw threads on the  
15 proximal and distal cylindrical sections 11, 13 are sized  
to be greater than the inner diameter of complementary  
cylindrical sections of the outer cavity section 32 and  
the drilled hole 31 provided in the cavity 30 of the fe-  
mur neck (See Fig. 7). Accordingly, the intraosseous an-  
20 choring section 3 is able to be anchored in the cavity 30  
by screwing of the femur fixture 1 into the cavity 30,  
with the screw threads on the proximal and distal cylin-  
drical sections 11, 13 threading into the bone tissue in  
the boundary wall of the cavity 30.

25       As seen in Fig. 8, the diameter of the proximal cy-  
lindrical section 11 is in fact sized such that the  
threads thereon register in the peripheral layer of cor-  
tical bone 34 in the femur neck, as outlined in  
WO93/16663 and WO97/25939. The threads on the proximal  
30 cylindrical section 11 are thus secured in the stronger  
cortical bone 34 as opposed to the spongier cancellous  
bone 35, thereby giving the femur fixture 1 greater fixa-  
tion in the femur neck. Due to the fact that the femur  
dimensions can vary from patient to patient, the diameter  
35 of the proximal cylindrical section can vary in the range  
from approximately 16-26 mm (cf. Figs 3 and 8).

As illustrated in Fig. 8, the axial length of the intraosseous anchoring section 3 is such that in the anchored position of the intraosseous anchoring section 3, the distal end 12 thereof projects through the lateral cortex 34 of the femur.

With reference to Figs 3-5, the frusto-conical proximal section 18 also has threads thereon. The height of these threads is 0.2 mm (so-called microthreads) which is less than that of the threads on the proximal and distal cylindrical sections 11, 13. Further, the frusto-conical proximal section 18 is sized so that the microthreads engage with the cortex 34 of the femur neck at the resected surface. In the embodiment described herein, the frusto-conical terminal proximal section 18 has a flank angle of approximately  $12^\circ$ , and an axial extent of approximately 8 mm.

The distal diameter of the proximal section 18 is adapted to the diameter of the neighbouring proximal cylindrical section 11, such that there are no sharp edges in the transition area between the frusto-conical proximal section 18 and the proximal cylindrical section 11. Consequently, the proximal diameter of the frusto-conical proximal section 18 is in the range of approximately 20-30 mm.

The diameter of the distal cylindrical section 13 does not have to be varied in dependence of the femur dimensions of the patient. The diameter of the distal cylindrical section 13 is approximately 11 mm, or within the range of 10-12 mm.

The frusto-conical connecting section 15 interconnects the proximal and distal cylindrical sections 11, 13 to one another. In this embodiment, the diameters at the respective end of the connecting section 15 correspond to the diameters of the proximal and distal cylindrical sections 11, 13, respectively. In other words, the distal end of the connecting section 15 has essentially the same diameter as the distal cylindrical section 13, and the

proximal end of the connecting section 15 has essentially the same diameter as the proximal cylindrical section 11.

As a result of the fact that the diameter of the proximal cylindrical section 11 can be varied between  
5 different femur fixtures, while the diameter of the distal cylindrical section 13 is not varied, the dimensions of the connecting section will be varied in accordance with the varying difference in diameter between the proximal cylindrical section 11 and the distal cylindrical section 13. Since the axial extent of the connecting  
10 section is kept relatively short, i.e. within the range of approximately 7.5-10.5 mm, the flank angle of the connecting section can vary from approximately 20° for the narrowest fixture alternative, up to approximately 37°  
15 for the widest fixture alternative.

In the herein described embodiment of the invention, the surface of the frusto-conical connecting section 15 is provided with a grit-blasted surface for promoting the osseointegration between the surface and the surrounding  
20 cancellous bone tissue. The surface could also, or alternatively, be provided with a screw thread profile for promoting said osseointegration and improve the anchorage of the femur fixture 1. As a further alternative, the frusto-conical connecting section 15 may be left smooth,  
25 even polished.

As can be seen in figs 2 and 3, bridging the boundary between the proximal cylindrical section 11 and the frusto-conical connecting section 15 are a series of equi-spaced, circumferentially-arranged, sharp-edged cutting  
30 recesses or notches 14 for self-tapping into a pre-cut outer bone cavity section 32. The cutting recesses 14 each communicate with a channel 16 in the proximal cylindrical section 11 for autologous transplantation of the bone cut by the cutting recesses 14 as the femur fixture  
35 1 is screwed into the bore in the femur neck, as detailed in WO97/25939.

30       The anchorage of the femur fixture 1 is primarily  
reliant on the registration of the threads in the bone of  
the femur, principally the registration of the threads on  
the proximal cylindrical section 11 in the cortex 34 of  
the femur neck and the registration of the threads on the  
35 distal cylindrical section 13 in the lateral cortex 34 of  
the femur. This is in distinction to femur fixtures which

25

## CLAIMS

1. A femur fixture (1) for a hip-joint prosthesis, comprising an intraosseous anchoring structure (3) of a generally circular cross-section for screwing laterally into a complementary bore drilled laterally into the neck of a femur after resection of the femur head to an anchored position, the intraosseous anchoring structure (3) having a proximal end, a distal end, a relatively short frusto-conical proximal section (18) at the proximal end, and a proximal cylindrical section (11) having a screw thread profile thereon and extending towards the distal end from the frusto-conical proximal section (18), the frusto-conical proximal section (18) and the proximal cylindrical section (11) each being dimensioned so as to bear against the cortex of the femur neck when the intraosseous anchoring structure (3) is in the anchored position.

2. The femur fixture (1) as claimed in claim 1, wherein the intraosseous anchoring structure (3) is so dimensioned that its distal end projects through the lateral cortex (34) of the femur when the intraosseous anchoring structure (3) is in the anchored position.

3. The femur fixture (1) as claimed in claim 1 or 2, wherein the intraosseous anchoring structure (3) further has a distal cylindrical section (13) having a screw thread profile thereon and extending towards the proximal cylindrical section (11) from the distal end of the intraosseous anchoring structure (3), the diameter of said distal cylindrical section (11) being less than the diameter of said proximal cylindrical section (13).

4. The femur fixture (1) as claimed in claim 3, wherein the screw thread profiles of said proximal and distal cylindrical sections (11, 13) are essentially the same.

5. The femur fixture (1) as claimed in claim 3 or 4, wherein said intraosseous anchoring structure (3) further



comprises a tapered connecting section (15) provided between and interconnecting said proximal and distal cylindrical sections (11, 13).

6. The femur fixture (1) as claimed in claim 5,  
5 wherein said connecting section (15) has a frusto-conical shape which at one end has a base diameter essentially equal to the diameter of said proximal cylindrical section (11), and at the other end has a top diameter essentially equal to the diameter of said distal cylindrical  
10 section (13).

7. The femur fixture (1) as claimed in claim 5 or 6, wherein said connecting section (15) has a flank angle in the range of 15°-45°, preferably in the range of 20°-40°.

8. The femur fixture (1) as claimed in any one of  
15 claims 5-7, wherein said connecting section (15) is at least partly provided with a blasted surface, preferably a grit-blasted surface.

9. The femur fixture (1) as claimed in any one of claims 5-8, wherein said connecting section (15) is at  
20 least partly provided with a circumferentially oriented roughness, preferably in the form of circumferential beads or screw threads.

10. The femur fixture (1) as claimed in claim 9, wherein said circumferentially oriented roughness has a  
25 height less than that of the screw thread profiles of said proximal and distal cylindrical sections (11, 13).

11. The femur fixture (1) as claimed in claim 9 or 10, wherein the height of said circumferentially oriented roughness is no greater than 0.3 mm, preferably in the  
30 range of 0.1-0.25 mm, and even more preferably approximately 0.2 mm.

12. The femur fixture (1) as claimed in any one of claims 5-11, wherein said connecting section (15) is at least partly provided with a smooth surface.

35 13. The femur fixture (1) as claimed in any one of claims 5-7, wherein the entire surface of said connecting section (15) is smooth.





32. The femur fixture (1) as claimed in claim 31, wherein said distal surface (21) is inclined inwardly at an inclination angle within the range of 10°-20°, preferably approximately 15°.

5        33. The femur fixture (1) as claimed in claim 30, wherein said distal surface (21) is concave.

34. The femur fixture (1) as claimed in any one of claims 30-33, wherein said distal surface (21) is provided with radially spaced circular beads (22).

10       35. The femur fixture (1) as claimed in claim 34, wherein said circular beads have a height in the range of 0.1-0.5 mm, preferably in the range of 0.2-0.4 mm, and even more preferably approximately 0.3 mm.

15       36. A set of femur fixtures according to any one of the preceding claims, wherein the frusto-conical proximal section (18) and the proximal cylindrical section (11) of each fixture (1) in the set have different dimensions, whereby the fixture in the set having the frusto-conical proximal section (18) and the proximal cylindrical section (11) of correct size for abutting the cortex of the femur neck of a particular patient can be selected for use in that patient.

20       37. A set of femur fixtures according to claim 3, wherein the distal cylindrical sections (13) of all fixtures (1) in the set have the same dimension, and the frusto-conical proximal section (18) and the proximal cylindrical section (11) of each fixture (1) in the set have different dimensions, whereby the fixture in the set having the frusto-conical proximal section (18) and the proximal cylindrical section (11) of correct size for abutting the cortex of the femur neck of a particular patient can be selected for use in that patient.

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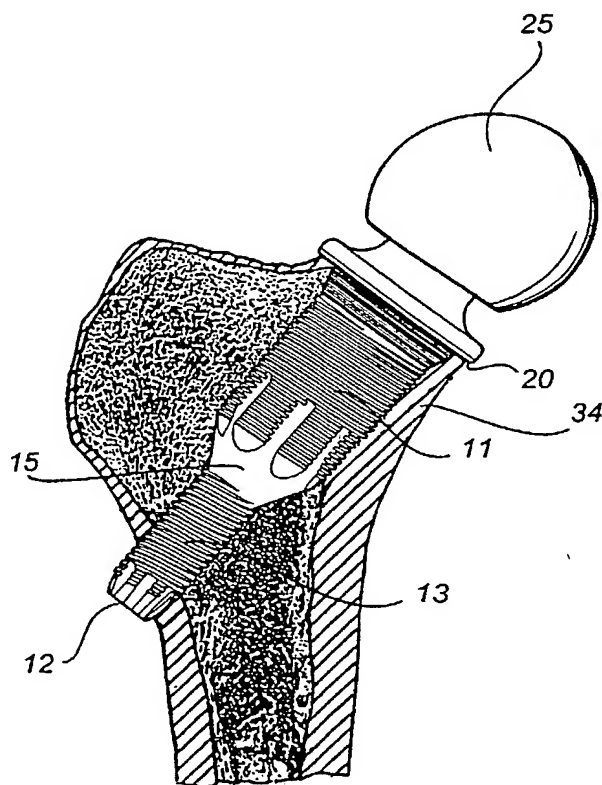
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(54) Title: FEMUR FIXTURE AND SET OF FEMUR FIXTURES



(57) Abstract: A femur fixture (1) for a hip-joint prosthesis comprising an intraosseous anchoring structure (3) of a generally circular cross-section for screwing laterally into a complementary bore drilled laterally into the neck of a femur after resection of the femur head to an anchored position. The intraosseous anchoring structure (3) has a proximal end, a distal end, a relatively short frusto-conical proximal section (18) at the proximal end, and a proximal cylindrical section (11) having a screw thread profile thereon. The proximal cylindrical section (11) extends from the frusto-conical proximal section towards the distal end of the anchoring structure (3). The frusto-conical proximal section (18) and the proximal cylindrical section (11) each being dimensioned so as to bear against the cortex of the femur neck when the intraosseous anchoring structure (3) is in the anchored position. The invention also relates to a set of such femur fixtures, wherein the frusto-conical proximal section (18) and the proximal cylindrical section (11) of each fixture (1) in the set have different dimensions, whereby the fixture in the set having the frusto-conical proximal section (18) and the proximal cylindrical section (11) of correct size for abutting the cortex of the femur neck of a particular patient can be selected for use in that patient.

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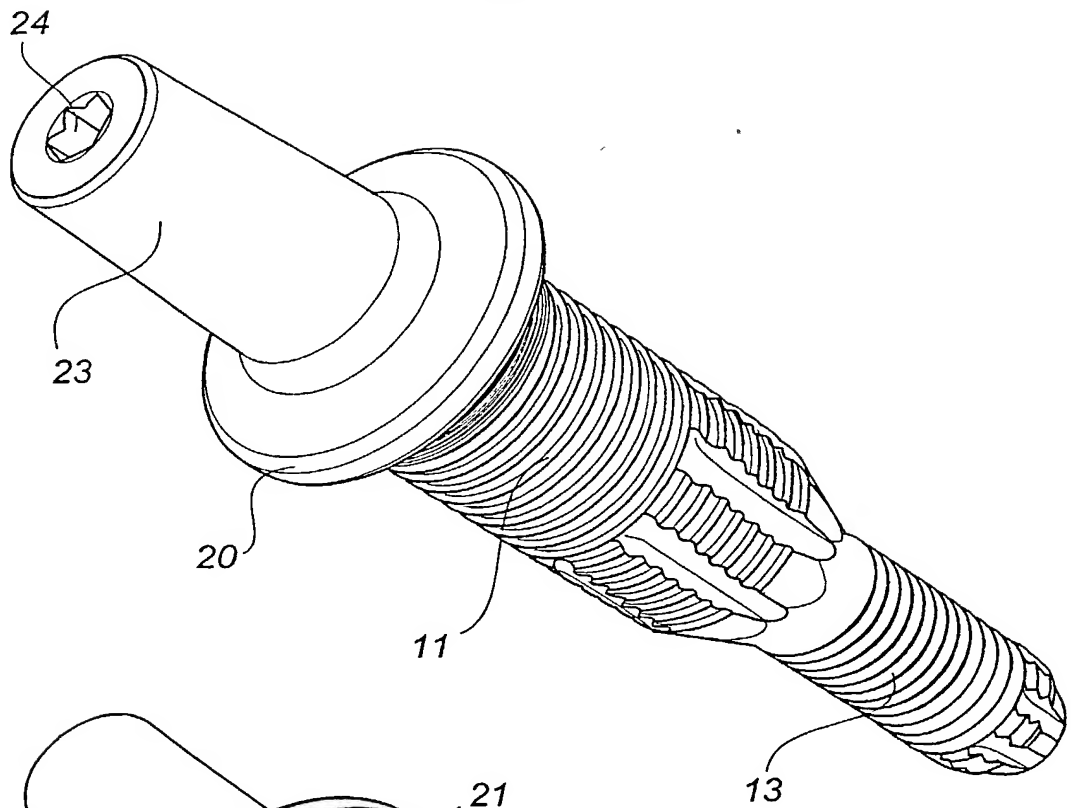


Fig. 1

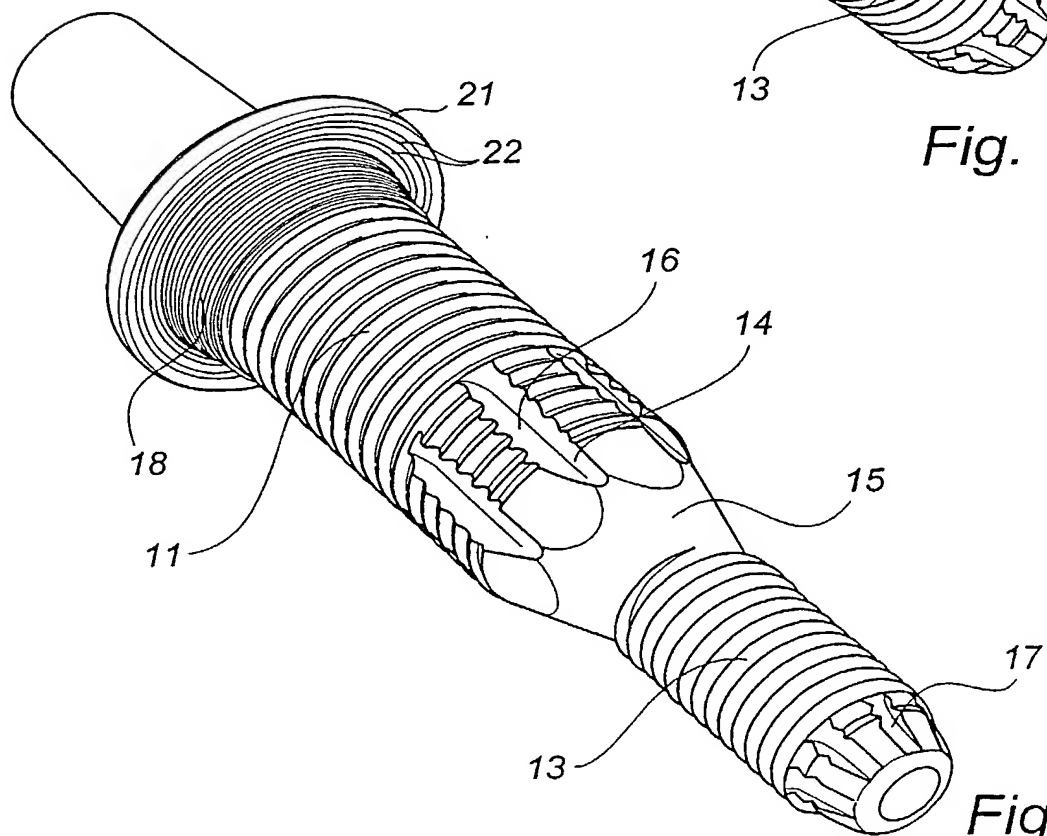
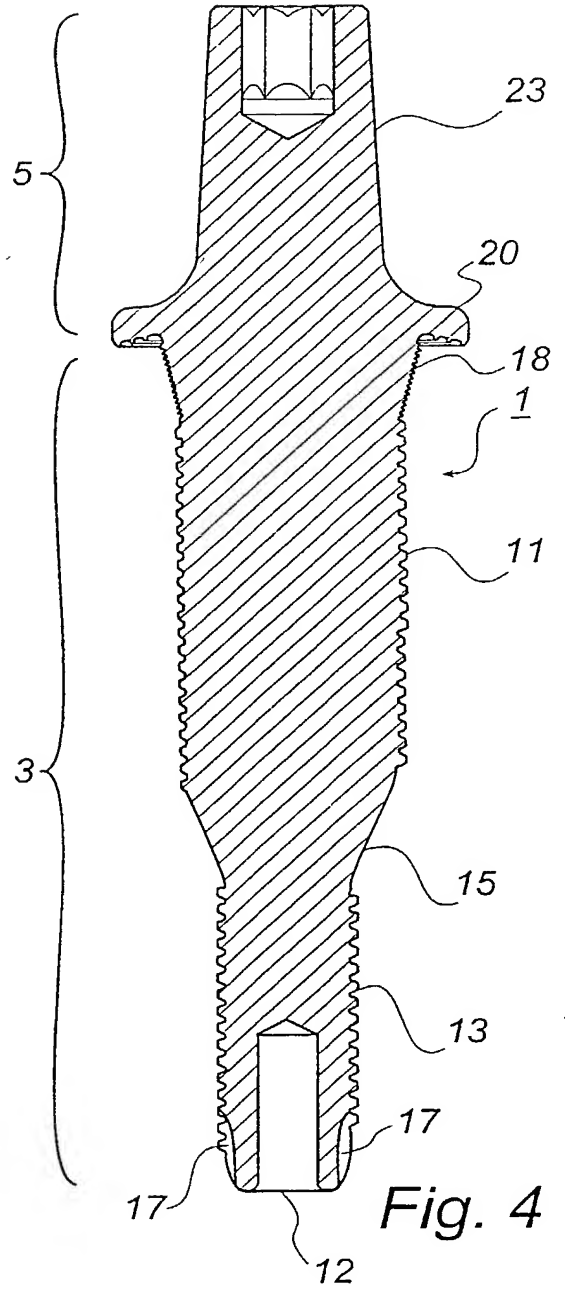
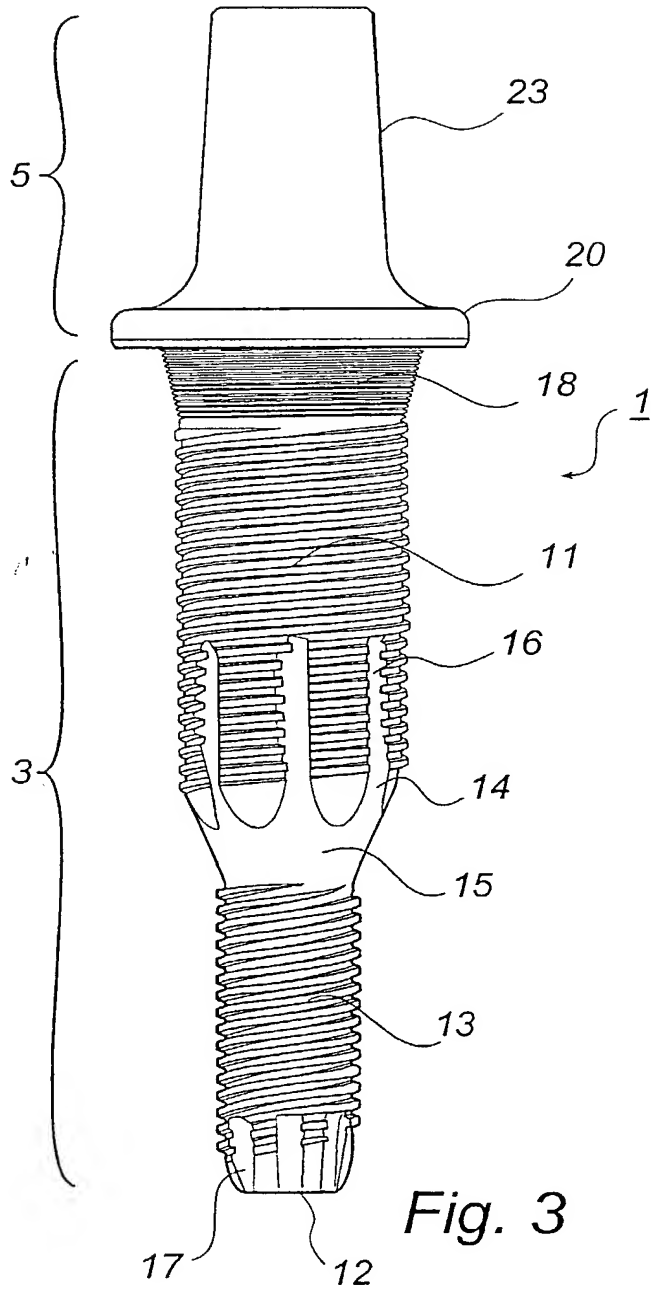


Fig. 2





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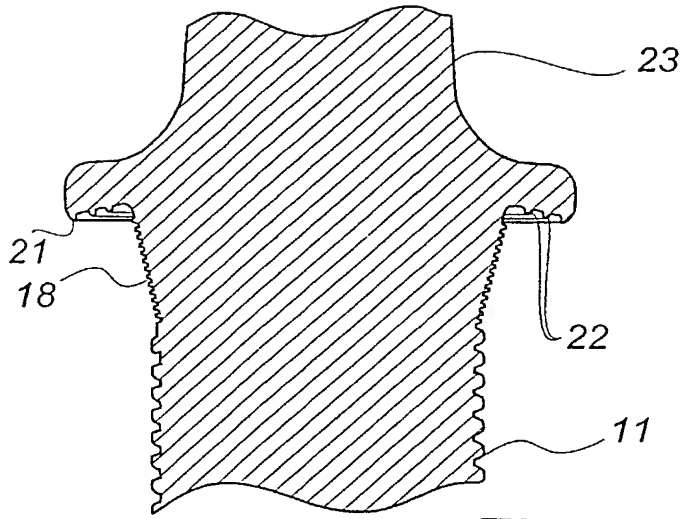


Fig. 5

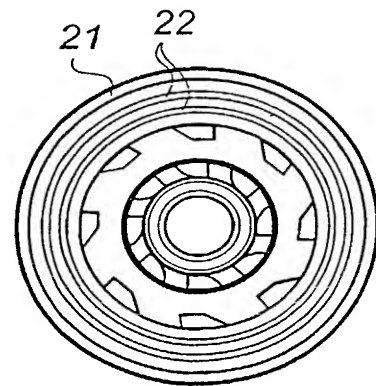


Fig. 6

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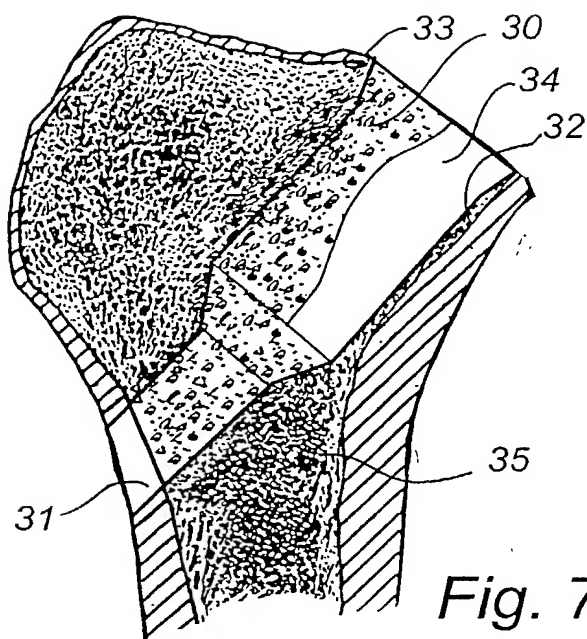


Fig. 7

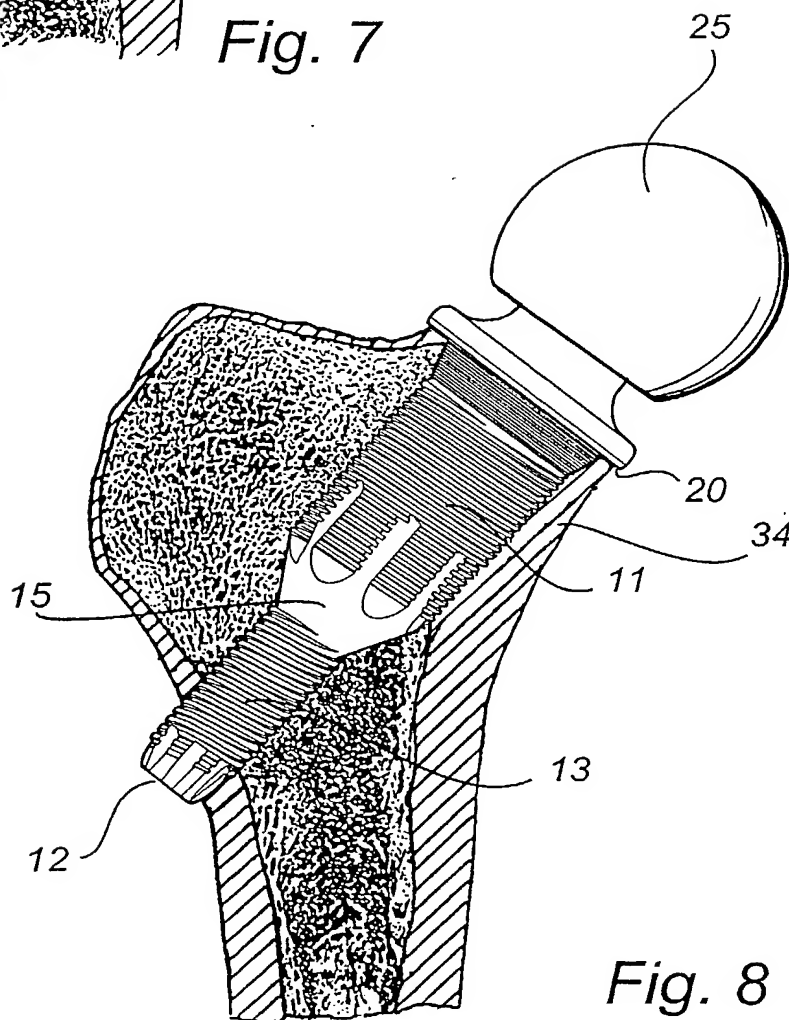


Fig. 8

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**Prior Foreign Application(s)**

**Priority Claimed**

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